

BROWN TREE CARE SITE STUMP DUMP

Options for Extinguishing the Subterranean Dump Fire

Site History

On September 19, 2018, the Arkansas Department of Environmental Quality (ADEQ) and Arkansas Department of Health (ADH), requested EPA assistance in determining if any hazards were involved with an underground fire at the Brown Tree Care Site in Bella Vista, AR (Brown Tree Care Site). The site is the location of a stump dump where stumps, vegetation and possibly other materials have been dumped in the past. The dump is not compacted and contains gaps between the debris which is allowing air to feed the fire. The site is also located in a ravine with unsecured and steep sites. The existing cap is unstable due to the lack of compaction and active subsidence.

The site is approximately 5 acres in area and is estimated to be 60 feet deep in some areas. The site is located on the 8000 block Trafalgar Rd, Benton County, Arkansas (Latitude 36.461346° North and Longitude 94.209098° West). The property is surrounded by residential properties to the north, east, south, and west amongst trees and rolling topography. A commercial storage facility, Blue Mountain Storage, is located directly south of the property.

EPA Activities

In mid-September, EPA was asked to sample the air at the site and the surrounding area. None of EPA's air samples showed elevated concentrations of chemicals of concern in the community. In support of ADEQ, EPA collected 24-hour air samples from 5 locations in the community around the Brown Tree Service property on October 1 and November 10. EPA tested for hundreds of chemicals associated with landfill fires potentially containing construction debris, household waste or tires.

In addition to the community samples, EPA collected samples from 1 location on the Brown Tree Service property, and on November 10, 2018 detected Benzene at a concentration of 0.03 part-per-million (ppm).

Benzene is a colorless, flammable, aromatic hydrocarbon that is a known carcinogen (WHO). Human exposure to benzene has been associated with a range of acute and long-term adverse health effects and diseases. According to the Agency for Toxic Substances and Disease Registry (ATSDR), exposure to benzene can result in a range of effects from drowsiness to unconsciousness and death depending on the exposure concentration and length of exposure. Exposure to lower levels (700 to 3,000 ppm) can cause drowsiness, dizziness, rapid heart rate, headaches, tremor, confusion and unconsciousness. In most cases, people will stop feeling these effects when they are no longer exposed and begin to breathe fresh air. Brief exposure (5-10 minutes) to very high levels of benzene in the air (10,000 – 20,000 ppm) can result in death.

EPA provided these results to ADEQ and ADH; given the detection of benzene on-site, the State of Arkansas requested EPA conduct additional sampling for volatile organic carbon (VOCs) compounds for a longer timeframe. In addition, due to community concerns, EPA sampled and analyzed for particulate matter. This additional sampling commenced on December 10, 2018 for

3 days of sampling for VOCs and monitoring for particulate matter (PM). The validated results for this round of sampling will be available on December 21, 2018.

In addition, EPA agreed to secure an experienced fire expert to advise the state and community regarding the properties of the current fire and recommendations on preferred options to extinguish the underground fire quickly and with the lowest possible environmental and public health consequences.

Options for extinguishing the underground fire at the Brown Tree Care Site

The siting conditions described in the site history section will complicate all of these options because additional site preparations will be required to access the dump safely with equipment. Technical experts from the Office of Research and Development (ORD) visited the site on December 13 and 14, 2018 and have provided technical feasibility comments on the following options to extinguish the underground fire quickly and with the lowest possible environmental and public health consequences.

Three Categories

1) Insertion of Inert Gas into Stump Dump

- a. Description - An injection of inert gas through a drilled bore hole would choke off the oxygen that is being supplied to the fire and as a result extinguish the fire.
- b. Issues - While this approach may work in theory, in practice it appears to be a challenge as the facility is reported to contain stumps in it that create void spaces in the waste mass, as well as concrete and asphalt that could impede drilling needed to inject the inert gas. The site appears to have insufficient bearing capacity to support heavy vehicles atop the waste mass, making it difficult to drill through those with a regular auger. In addition, there is limited access to bring treatment gas near the site. Drilled gas injection points often have a limited radius of influence with an inert gas injection. At another site that used liquid nitrogen, it worked after increasing the number of injection points needed to achieve the results desired. Sites where this approach has been attempted focused on putting out hot spots and seemed effective for a short duration, but the effectiveness dissipated rather quickly after injection ceased.
- c. Overall - Inert gas injection may work, it is doubtful that at this site the fire would be able to be controlled by this method due to site conditions and access. It will be problematic to place bore holes through the dump to apply the inert gas and volume required due to lack of compaction and the relatively high void spaces in the dump which would further limit this method's effectiveness. The economics of putting a fire out of this size with an inert gas injection is something that has not been researched and assumptions are it would be costly considering access and drilling required to get the gas into the waste mass.

2) Foam or Chemical Treatment

- a. Description – The application of foams or chemicals through drilled bore-holes to suppress or stop the fire.
- b. Issue - While this may also work in theory, in practice it appears to be a challenge at this facility for reasons stated in option 1. In addition, there are potential environmental and health impacts of using foams and chemicals that would be introduced into a watershed to a recreational lake. The type of chemical or foam used are unknown, and the concern is that those chemicals would contaminate the surface and ground waterways and then into the lake potentially creating another problem (unintended consequence). Any treatment through drilling and applying foams internally coupled with the uncapped sides of the dump and would likely require a water containment area to be constructed near surface waters to capture and treat any foams or chemicals that would be released to prevent stream contamination.
- c. Overall - While foams or chemicals have been used in a landfill setting to put out fires, it will be problematic at this site to place bore holes through the dump at this site to apply the foams or chemicals in the volume required due to lack bearing capacity, vehicle access, lack of compaction; voids in the dump would further limit this methods effectiveness. In addition, the unintended consequences of using these compounds may be an issue, thus, in the long term this may not be an optimal method of putting out the fire.

3) Excavation and Douse with Water

- a. Description - Excavation and dousing is another possibly viable method of putting out the fire at this site. The perimeter of the site is inaccessible now, potentially putting a 20 to 25 feet wide road or fire break around the site would allow trucks, excavators and water cannon trucks access the perimeter and excavate the site. The excavator would remove all materials in a sequential manner, pulling out the pieces of wood or other debris from the site; and if the material is on fire, erupts or flares up, the water cannon truck would be used to put that fire out. Once doused the material could be placed on or off site and capped to prevent future ember or water intrusion.
- b. Issues - This approach has been used at landfill sites, specifically in Ohio (although that site was not tree stump site, but a RCRA municipal solid waste site). Also, due to the lack of compaction (i.e., voids), this may be the only way to ensure all the hot spots are being accessed by the response action. A technical challenge of such an approach is that the odor and smoke may temporarily worsen while remediation measures are underway and continue until the site is fully treated. It would be prudent to inform the local citizenry of this possibility so that they can take appropriate precautions. A temporary collection area would need to be constructed to collect waters used to control flames as well as water used to douse the waste to prevent contamination of surface and ground waters.

- c. Overall – Should this remedy be selected, the winter season offers some benefit - compared to warmer weather because residents may spend more time indoors in winter reducing possible exposure to the smoke during remediation. This option is likely a costlier approach, but it is an approach that has been utilized successfully. After the waste is removed and doused, one disposal option is replacement of the waste at the current site in a manner engineered to ensure proper placement and prevent a future fire. Another option is for the waste to be shipped offsite or destroyed on-site, when applicable.

Option	Pros	Cons
1. Insertion of Inert Gas	Works in theory and in limited areas	<p>Problem in placing bore holes due lack of compaction and voids in the dump</p> <p>Economics has not been researched at a fire of this size; could be costly</p>
2. Foam or Chemical Treatment	Previously used in MSW waste landfill settings	<p>Problem in placing bore holes due lack of compaction and voids in the dump</p> <p>Foams and chemicals can be toxic; application would likely result in unintended consequences to the watershed and lake</p> <p>Requires temporary collection area due to the runoff</p> <p>Economics has not been researched at a fire of this size; could be costly</p>
3. Excavation and Douse with Water	Will ensure all hot spots are being accessed by the response action	<p>Could pose hazard to responders; extra precautions will need to be taken</p> <p>Odor and smoke will get worse during remediation impacting residents. May pose health risk to residents; extra precautions will need to be taken</p> <p>Requires temporary collection area due to the runoff</p> <p>Costly approach</p>